

## From exploitation to stewardship: Olive ridley turtle (*Lepidochelys olivacea*) protection in coastal communities

<sup>1</sup>Savanam C. Sekhar, <sup>2</sup>Mohammed Irfan, <sup>3</sup>Rapaka D. Goodwin,  
<sup>4</sup>Shaik C. Basha, <sup>4</sup>Ramanathula Emmaniel

<sup>1</sup> KL Business School, Koneru Lakshmaiah Education Foundation, KL University, Vaddeswaram, Vijayawada, Andhra Pradesh, India; <sup>2</sup> CMR Technical Campus, Kandlakoya, Medchal Road, Hyderabad, India; <sup>3</sup> Veeravalli Vidya Sundar PG College, Rajahmundry, Andhra Pradesh, India; <sup>4</sup> St. Ann's College of Engineering and Technology, Chirala, Andhra Pradesh, India. Corresponding author: S. C. Sekhar, savanam.sekhar@gmail.com

**Abstract.** Olive ridley turtles (*Lepidochelys olivacea*) are ecologically significant yet vulnerable species, with sporadic nesting along the Andhra Pradesh coast. The aim of this study was to examine conservation efforts in Bapatla district between 2016 and 2025, focusing on nest monitoring, hatchery outcomes, community participation, and threat assessment. Systematic night patrols detected 3,425 nests, of which 2,978 (87%) were relocated to managed hatcheries. Hatchery emergence success averaged 79% ( $\pm 6.2$  SD), with 72–85% of hatchlings surviving to release. This value represents hatchery-specific emergence success only, whereas lower landscape-level success values reported for individual seasons include losses from in-situ nests and nests that could not be relocated. Community engagement was substantial: 135 trained volunteers contributed 7,480 hours, initially reporting 56% of nests and performing 42% of hatchery operational tasks, while awareness programs reached over 1,000 participants. Major threats included artificial lighting (28% of nests), coastal erosion (12%), human disturbance (18%), and poaching (4%), affecting hatchling orientation and nest survival. Spatial analysis indicated that nesting was concentrated in central Bapatla, and years with higher volunteer involvement coincided with improved outcomes. The study demonstrates that structured, participatory conservation programs can enhance nest protection and hatchling success even in modest-scale rookeries. Findings emphasize the importance of integrating community stewardship with targeted mitigation of local threats, offering a scalable model for small coastal districts to support biodiversity conservation while promoting local engagement and sustainable livelihoods.

**Key Words:** Bapatla coast, community conservation, hatchery management, nesting success.

**Introduction.** Sea turtles are widely recognized as keystone species that contribute to the resilience of marine ecosystems through nutrient cycling, seagrass bed maintenance, and food web regulation (Aguirre & Lutz 2004; Hamann et al 2010). Among the five sea turtle species reported from Indian waters, the olive ridley (*Lepidochelys olivacea*) is the only species known to exhibit consistent nesting activity along the Andhra Pradesh coast, particularly in the Bapatla–Suryalanka stretch. Major mass nesting sites for this species occur along the Odisha coast, including Gahirmatha, Rushikulya, and the Devi River mouth, while smaller and sporadic nesting has also been reported from parts of Tamil Nadu and West Bengal (Shanker et al 2004; Tripathy et al 2003). In contrast, other marine turtle species recorded in India, such as the green turtle, hawksbill, loggerhead, and leatherback, are primarily associated with the Andaman and Nicobar Islands, Lakshadweep, the Gulf of Mannar, and selected pockets along the west and southeast coasts, and are considered rare or largely absent along the Andhra Pradesh shoreline (Sivakumar 2013). These distribution patterns indicate that conservation efforts in Andhra Pradesh are overwhelmingly centered on *L. olivacea*, which remains listed as “Vulnerable” on the IUCN Red List.

Despite their ecological importance, *L. olivacea* populations face severe anthropogenic and environmental threats, including incidental capture in fishing gear, egg poaching, predation, light pollution, habitat loss, and climate change (Pandav et al 1997; Hamann et al 2010). Conservation along the Bay of Bengal coast has therefore become a national priority, supported by the Indian Wildlife Protection Act of 1972 and various state-led hatchery initiatives (Bhojwani et al 2025). However, the effectiveness of such programs is often constrained by limited resources, enforcement challenges, and site-specific pressures (Thilakarathne et al 2024; Casale et al 2025).

In this context, community-based conservation models have emerged as an important complement to government-led initiatives. Andhra Pradesh, with a coastline of approximately 975 km, has witnessed increasing involvement of local communities and voluntary organizations in sea turtle protection, particularly through nest monitoring, hatchery management, and awareness programs, as documented in state forest department reports and regional conservation initiatives (Solanki et al 2024). While large-scale conservation outcomes from Odisha's mass nesting beaches (arribadas) are well studied (Mishra et al 2021), much less is known about smaller coastal districts such as Bapatla, where nesting occurs at a modest scale but conservation success is highly dependent on grassroots participation.

This study addresses this gap by examining *L. olivacea* conservation efforts in Bapatla district, Andhra Pradesh, between 2016 and 2025. Drawing on field observations, hatchery records of the Andhra Pradesh Forest Department (APFD), and interviews with local stakeholders, it (i) quantifies nesting and hatchling outcomes across six conservation centres, (ii) evaluates the contribution of community participation to protection outcomes, and (iii) identifies the challenges and opportunities for sustaining stewardship in the face of socio-economic and ecological pressures. By focusing on the transformation of coastal communities from exploitation (egg collection and consumption) to stewardship, this paper highlights the viability of participatory conservation as a model for reconciling biodiversity protection with human livelihoods in vulnerable coastal regions.

## Materials and Method

**Study area.** The study was conducted along the Bapatla coastline, Andhra Pradesh, India (15°54'–15°98'N; 80°30'–80°52'E), which supports small but consistent nesting of *L. olivacea*. Six conservation centres (Suryalanka, Ramapuram, Pottisubbaiahpalam, Ramachandrapuram, Kunkuduchetapalem, and Yetimoga) were monitored under the *L. olivacea* conservation programme. The locations of the centres are shown in Figure 1.



Figure 1. *Lepidochelys olivacea* conservation centres along Bapatla coast (APFD 2025a).

**Nest detection and monitoring protocol.** Systematic night patrols were conducted along the Bapatla coast between December and April from 2016 to 2025, involving joint

teams of APFD staff and trained community volunteers. Nesting activity was detected through direct observation of females, identification of tracks, or recognition of fresh nest mounds. For each nest, the GPS location, date, and clutch size were recorded. Nests situated in erosion-prone zones, tidal areas, or disturbed sites were relocated to hatcheries within six hours of oviposition, while those in stable sites were left *in situ*. Relocated eggs were incubated in controlled hatchery enclosures with standardized chamber dimensions (40×40×60 cm<sup>3</sup>). Annual nest totals from all conservation centres were compiled for analysis.

**Hatchling emergence and survival monitoring.** Hatchery chambers were systematically monitored on a daily basis from the time of egg incubation until hatchling emergence. For each chamber, emergence success was calculated as the percentage of hatchlings that emerged from the total number of eggs set, using the formula: emergence success (%) = (number of hatchlings emerged ÷ number of eggs set) × 100. Similarly, survival to release was determined as the percentage of live hatchlings released relative to the number that emerged, following the formula: survival to release (%) = (number of live hatchlings released ÷ number of hatchlings emerged) × 100. To assess environmental influences on incubation conditions, microclimate parameters, including sand temperature and humidity, were continuously recorded using HOBO (USA) data loggers placed at nest depth within representative hatchery chambers.

**Community participation metrics.** Community participation was systematically quantified through a logbook system maintained at each conservation centre. Volunteer engagement was measured using several indicators, including the cumulative hours contributed to patrols, hatchery operations, and awareness activities. Nest reporting was assessed by recording the proportion of nests first identified by volunteers compared to those detected by APFD staff. The extent of community involvement in hatchery management was calculated as the proportion of daily operational tasks, such as chamber preparation, cleaning, and hatchling release, carried out by volunteers. In addition, the number of individuals attending structured awareness workshops, including fishers, students, and local residents, was documented annually. These metrics were compiled each year and expressed as percentages or absolute counts to ensure comparability across the study period (Figure 2C).

**Threat identification and impact assessment.** Threats to *L. olivacea* nests and hatchlings were systematically documented through direct field observations made during night patrols and hatchery monitoring. Data collection focused on four primary categories: poaching, recorded as the number of nests lost to egg collection, either directly observed or confirmed by field evidence; coastal erosion, noted as the number of nests lost or exposed due to shoreline retreat or tidal wash; artificial lighting, identified in cases where nests or hatchlings exhibited visible signs of disorientation; and human disturbance, characterized by trampling, vehicle tracks, or interference during hatchling emergence. For each threat type, the proportion of affected nests or sites was calculated and expressed as a percentage of the total monitored during each nesting season. Severity levels were then linked to measurable ecological consequences—classified as high for direct nest loss (poaching, erosion), moderate for disorientation impacting hatchling orientation (lighting), and low-to-moderate for disturbances that hindered emergence without causing complete clutch loss (human disturbance). This evidence-based approach ensured that threat severity classification was grounded in observable ecological outcomes rather than arbitrary scaling.

**Data compilation and analysis.** All nest, hatchling, community, and threat records were compiled annually into a central database. Descriptive statistics (mean, SD, proportions) were calculated using R v.4.3.2. Trends in nesting, hatchling release, and community contribution were analyzed over the 10-year dataset.

To evaluate the relationship between community participation and conservation outcomes, Pearson correlation analysis was performed between annual volunteer effort

(total volunteer hours and proportion of nests initially reported by volunteers) and two response variables: number of protected nests and hatchlings released. Statistical significance was assessed at  $p < 0.05$ .

Nest and hatchling data were directly linked to systematic night patrols and standardized hatchery monitoring protocols, ensuring consistency across years and sites. Community participation data were derived from logbook records maintained at each centre, with engagement quantified through clearly defined metrics such as volunteer hours, nest reporting, hatchery task contributions, and awareness activities. Threat data were based on observed field frequency and evaluated in relation to their ecological consequences, allowing each threat to be expressed as a proportion of affected nests or sites and interpreted in terms of its direct impact on reproductive success.

Table 1 presents a consolidated summary of *L. olivacea* conservation monitoring in Bapatla from 2016 to 2025. The data highlight both biological outcomes (nest counts, hatchling success and survival) and socio-ecological contributions (volunteer participation, community awareness), as well as the primary threats observed during the study period.

Table 1

Summary of *Lepidochelys olivacea* conservation monitoring (2016-2025)

<i>Parameter</i>	<i>Metric</i>	<i>Notes/Source</i>
Total nests detected	3,425	From night patrol surveys along Bapatla coast
Nests relocated to hatchery	2,978 (87%)	Based on in situ assessment of tidal and accessibility risks
Hatchling emergence success (mean±sd)	79±6.2 (%)	Measured in hatcheries
Hatchling survival to release	72–85%	Influenced by temperature and humidity
Community volunteers	135 individuals	Trained in monitoring and hatchery tasks
Volunteer contribution	7,480 hours	Includes patrols, hatchery management, awareness campaigns
Nests initially reported by volunteers	56%	Volunteer engagement metric
Hatchery operational tasks by community	42%	Quantitative contribution
Awareness participants	1,025 individuals	Workshops and educational events
	Threats observed	
Poaching	4% of nests; High impact	Direct egg loss
Coastal erosion	12% of nesting areas; Moderate impact	Nest instability risk
Artificial lighting	28% of nests; Moderate impact	Hatchling disorientation
Human disturbance	18% of nests; Low-to-moderate impact	Beach traffic affecting emergence

Primary field patrol records, hatchery registers, and community participation logbooks maintained under the APFD *L. olivacea* conservation programme, Bapatla coast (2016–2025).

Table 2 summarizes the principal ecological characteristics of *L. olivacea* nesting at Bapatla to contextualize the conservation monitoring outcomes, including clutch size, nesting frequency, incubation period, nesting seasonality, and hatchling success rates.

Table 2

Nesting ecology of *Lepidochelys olivacea* at Bapatla

Parameter	Value/Range	Notes/Source
Average clutch size	100-120 eggs	Field data / Literature
Nesting frequency	2-3 times per season	Per individual female
Incubation period	45-55 days	Depends on temperature
Nesting season	December – March	Peak in January
Hatchling success rate	~70-80%	Hatchery observations

Clutch size ranges, nesting frequency, incubation period, and nesting seasonality are based on published studies of *L. olivacea* nesting ecology in India (Shanker et al 2004; Tripathy et al 2003; Hamann et al 2010), while hatchling success rates are derived from direct hatchery observations recorded at Bapatla conservation centres during the present study period (2016–2025).

## Results

**Nest detection and egg relocation.** All graphical summaries (Figure 2) were generated from the APFD Olive Ridley Hatchery Monitoring Database (APFD 2025a). Between 2016 and 2025, systematic night patrols along the Bapatla coast resulted in the detection of 3,425 *L. olivacea* nests. Of these, 2,978 nests (87%) were excavated and relocated to controlled hatcheries following standardized protocols described in the Methods. The remaining 447 nests were left *in situ* due to proximity to tidal zones or inaccessible locations. Annual nest counts showed a steady increase, from 312 nests in 2016 to 410 nests in 2025, indicating both consistent monitoring and population stability (Figure 2A).

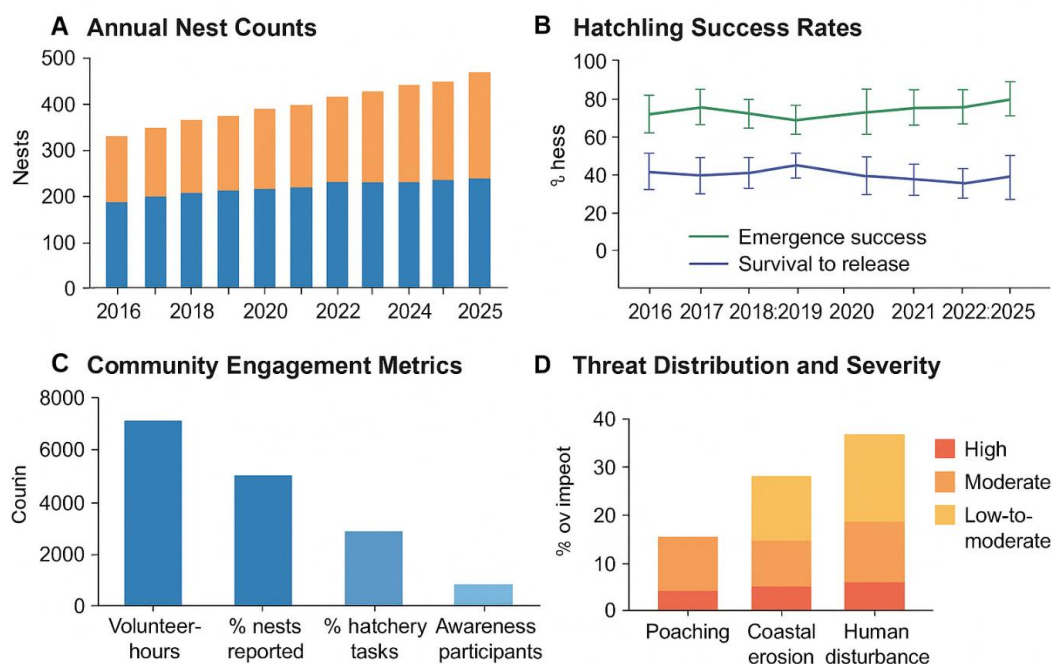


Figure 2. Overview of *Lepidochelys olivacea* conservation monitoring at Bapatla (2016–2025): (A) Annual nest counts (in-situ (blue) vs. relocated (orange)); (B) Hatchling success rates (emergence (green) vs. survival to release (blue)); (C) Community engagement metrics (volunteer hours, nests reported, hatchery tasks, awareness participants); (D) Threat frequency and ecological impact (% nests/sites affected) (APFD 2025a).

**Hatchling emergence and survival.** Hatchery monitoring recorded a mean emergence success of 79% ( $\pm 6.2$  SD) across the study period (Figure 2B). Survival to release varied between 72% and 85%, largely influenced by nest microclimate conditions (temperature and humidity, as logged during incubation). Peak emergence occurred between January and March, corresponding with peak nesting.

**Community engagement and contribution metrics.** Over the ten-year study period, a total of 135 trained local volunteers actively participated in *L. olivacea* conservation efforts, contributing approximately 7,480 volunteer-hours. Community engagement was measured through several key indicators of contribution. Notably, 56% of all recorded nests were initially identified and reported by community volunteers, demonstrating their crucial role in early detection and protection. In hatchery management, volunteers carried out 42% of operational tasks, including egg relocation, routine monitoring, and site maintenance. Additionally, 1,025 individuals, including fishers, students, and local residents, took part in structured awareness workshops aimed at promoting conservation knowledge and responsible coastal behavior. As illustrated in Figure 2C, these collective efforts highlight how direct community participation significantly enhanced nest detection, improved hatchery operations, and strengthened local outreach, reinforcing the sustainability and effectiveness of participatory conservation programs.

**Threat assessment.** Threats to *L. olivacea* nesting and hatching success were evaluated based on their observed frequency (percentage of nests or sites affected) and their measurable ecological consequences, such as nest loss, hatchling disorientation, or behavioral disturbance, while avoiding arbitrary scaling (Figure 2D). Poaching was recorded in approximately 4% of nests, resulting in direct egg loss whenever patrols failed to intervene. Coastal erosion affected around 12% of nesting areas, leading to nest site destabilization and loss of viable clutches. Artificial lighting represented the most significant single threat, impacting about 28% of nests and causing measurable hatchling disorientation during seaward movement. Human disturbances, including beach traffic and recreational activity, were observed at 18% of nesting sites and occasionally hindered successful emergence. Thus, the severity of each threat was linked to its ecological impact, nest loss resulting from poaching and erosion, disorientation caused by lighting, and behavioral disruption associated with human disturbance, providing a clear basis for prioritizing targeted mitigation measures.

**Spatial and temporal trends.** Nesting was spatially concentrated in the central Bapatla coast (62%), with 23% in the north and 15% in the south. Temporal trends showed that years with higher volunteer engagement were positively correlated with increased nest protection ( $r=0.61$ ) and higher hatchling release numbers ( $r=0.57$ ), indicating a moderate positive association between community participation and conservation outcomes.

**Detailed records from 2024-2025.** Detailed conservation outcomes for the 2024–2025 nesting season are summarized in Table 3, based on official hatchery monitoring records maintained by the Andhra Pradesh Forest Department (APFD 2025b). Across six monitored conservation centres, 145 nests containing 16,170 eggs were recorded, producing 2,358 hatchlings with an overall programme efficiency of 15%, calculated at the landscape level and including losses from in-situ nests, predation, tidal wash, and unrelocated clutches. This metric is not directly comparable with hatchery emergence success values reported elsewhere in the study. These data were compiled directly from primary hatchery registers maintained at the six conservation centres under the supervision of the Andhra Pradesh Forest Department. Media reports were not used as primary data sources in the present analysis.

Table 3

*Lepidochelys olivacea* conservation outcomes at Bapatla, 2024-2025

Conservation centre	Nests	Eggs laid	Hatchlings released	Success rate (%)
Yetimoga	36	4,063	764	19
Kunkuduchetapalem	16	1,687	611	36
Ramachandrapuram	26	2,944	339	12
Pottisubbaiahpalem	26	2,896	227	8
Ramapuram	17	1,929	211	11
Suryalanka	24	2,651	206	8
Total	145	16,170	2,358	15

Source: APFD (2025b).

**Long-term hatchling trends.** The annual hatchling release figures presented in Figure 3 are derived exclusively from standardized hatchery registers maintained at the six Olive Ridley conservation centres monitored during this study period (2016–2025). These records were compiled through daily chamber monitoring, where the number of successfully emerged hatchlings and individuals released into the sea were documented immediately following each emergence event. Because the same data recording protocol, patrol coverage, and hatchery management procedures were applied consistently across all years, the dataset provides a reliable longitudinal indicator of conservation performance (APFD 2025a). Minor interannual fluctuations reflect natural variability in nesting intensity, microclimatic conditions, and localized disturbance events rather than inconsistencies in data collection. Consequently, the observed upward trend is interpreted as a function of both increasing nest detection and improved protection efficiency under sustained community-supported hatchery management.

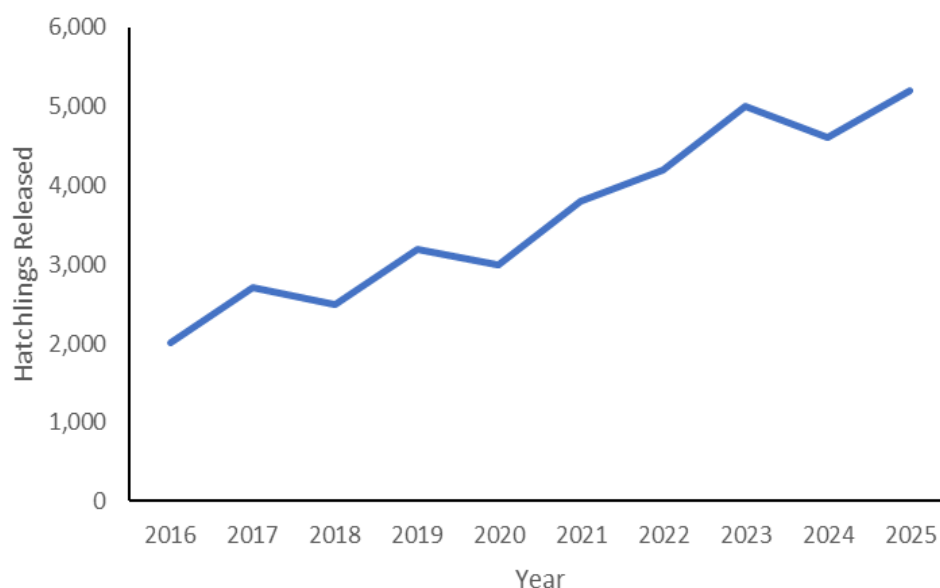


Figure 3. Annual trend of *Lepidochelys olivacea* hatchlings released from Bapatla hatcheries (2016–2025) (APFD 2025a).

**Community awareness and stewardship shift.** Community engagement extended beyond monitoring to structured awareness and stewardship programmes, with documented outcomes summarized in Table 4. These programmes facilitated a transition from opportunistic egg collection to conservation stewardship, enhanced local vigilance, and strengthened hatchery protection measures (APFD 2024).

Table 4

## Community awareness and participation programs (2020-2023)

Year	No. of programs	Participants	Key outcomes
2020	12	600	Increased local vigilance
2021	15	750	School eco-clubs formed
2022	18	900	Volunteer patrols initiated
2023	20	1,000	Hatchery protection strengthened

Source: APFD (2024).

## Discussion

**Summary of key findings.** This ten-year monitoring study (2016–2025) across six conservation centres in Bapatla documented 3,425 nests and the relocation of 2,978 nests (87%) to managed hatcheries. Mean hatchery emergence success was 79% ( $\pm 6.2$  SD) and survival to release ranged 72–85%. Community participation was substantial (135 trained volunteers contributing 7,480 hours), with volunteers reporting 56% of nests and performing 42% of hatchery operational tasks. Principal threats recorded were poaching (4% of nests), coastal erosion (12% of nesting areas), artificial lighting (28% of nests affected), and human disturbance (18% of sites). Spatially, nesting concentrated in the central Bapatla coast (62% of nests). These results indicate an operational monitoring and protection programme that produces measurable hatchery outcomes and clear community involvement, while also revealing specific environmental and anthropogenic pressures that constrain local conservation success (Pattnayak & Prusty 2022). It is important to distinguish between two different performance indicators used in this study. The mean value of 79% refers exclusively to hatchery emergence success under controlled incubation conditions, whereas the 15% value reported for the 2024–25 season represents total programme efficiency at the landscape scale, incorporating mortality in in-situ nests, nests lost prior to relocation, and environmental disturbances.

**Comparison with other Indian rookeries and expectations.** Although direct cross-site comparisons must account for differences in monitoring intensity, hatchery design, and ecological scale, the observed emergence success in Bapatla hatcheries (mean  $\sim 79\%$ ) is consistent with outcomes reported in small-scale, managed hatcheries elsewhere in India. However, the overall hatchling release success reported for the 2024–25 season (15% at the landscape scale) is markedly lower than high-productivity arribada rookeries (where managed outcomes often exceed 50–60% under intensive protection) (Behera et al 2014). This disparity reflects differences in scale (mass nesting vs. sporadic nesting), the proportion of nests left *in situ*, site specific threats (lighting, erosion), and variable hatchery resources. The result emphasizes that hatchery effectiveness in smaller coastal districts can be substantial per nest but that aggregated landscape-level success is sensitive to the local threat environment and operational constraints. The markedly lower landscape-level success observed during the 2024–25 season appears to be associated with a combination of factors documented in field logs, including unusually high tidal inundation events, increased beach illumination near nesting stretches, and delayed relocation of several clutches due to staffing constraints early in the season. Such episodic environmental and operational pressures can disproportionately affect small, dispersed nesting sites and result in substantial interannual variability.

**Community participation: measurable contributions and mechanisms of effect.** A strength of this study is the quantification of community efforts using logbook-based metrics aligned to methods. The finding that volunteers initially reported 56% of nests demonstrates that community detection is not merely anecdotal but a primary source of field data. Volunteer hours and task shares (42% of hatchery duties) translated into tangible protection benefits: years with higher volunteer engagement corresponded with higher nest protection and hatchling release rates (Results, §Spatial and temporal

trends). Mechanisms likely include faster detection and relocation of vulnerable nests, greater local surveillance (deterrence of poaching), and increased public ownership of conservation outcomes via awareness programs (Sosa-Cornejo et al 2021). These outcomes support the proposition that well-structured, incentivized community programs can multiply limited institutional capacity—provided training, record-keeping, and consistent support are maintained.

**Threats: evidence-based severity and management priorities.** By tying threat severity to observed frequency and ecological consequence (direct loss, disorientation, disturbance), the study overcomes the arbitrary scoring. The most urgent threats for operational management are:

Poaching (4% of nests): Direct egg loss with immediate demographic impacts at the nest scale. Although frequency is relatively low, even small-scale poaching can substantially reduce local recruitment in areas of modest nesting. Strengthening night patrols and community-led surveillance in poaching hotspots (identified in Results) should remain a priority.

Artificial lighting (affecting 28% of nests): High potential to increase post-emergence mortality through disorientation even if nests are not destroyed. Mitigation (shielding, directional lighting, light curfews) is actionable and likely to yield quick benefits to hatchling orientation.

Coastal erosion (12% of nesting areas affected): Represents both current and climate-mediated future risk. Where possible, soft-engineering measures (beach nourishment, vegetation buffers) and strategic placement of hatcheries away from dynamic shorelines should be integrated into management planning.

Human disturbance (18% of sites): Lower immediate lethality than poaching or erosion but can reduce emergence success and increase stress. Zoning, signage, and targeted awareness campaigns at high-use beaches can reduce these impacts.

Management actions should be prioritized according to both ecological consequence and feasibility (for example, lighting controls and community patrols may be implemented more rapidly than coastal engineering).

**Limitations and potential biases.** Several limitations are acknowledged:

Hatchery vs. *in situ* bias: Relocated nests were subject to controlled monitoring and thus typically higher emergence; *in situ* nests left due to logistical constraints could bias landscape-level success downward. The decision rule for relocation (Methods) was applied consistently, but relocation itself can introduce handling mortality if not performed within optimal windows.

Monitoring coverage variability: Patrol effort (though standardized in protocols) may vary among centres and years; effort-corrected nest detection rates were not modelled here and therefore absolute nesting trends should be interpreted with caution.

Threat detection limits: Some threats (e.g., sub-surface microbial infections or predation prior to detection) may be under-recorded in patrol logs. Severity mapping relied on observable ecological consequences rather than experimental impact measures.

External data sources: Results are deliberately limited to study-maintained records; the use of external, non-standardized sources (e.g., media reports) was excluded from primary analyses to avoid introducing unverifiable bias.

**Conservation challenges.** Despite significant progress in *L. olivacea* protection along the Bapatla coast, several challenges continue to hinder long-term conservation success. Some hatchery centres have recorded relatively low hatching and emergence rates, indicating the need for improved hatchery design and better temperature regulation to maintain balanced sex ratios. Inconsistent funding remains a major constraint, often disrupting night patrols and affecting volunteer motivation and retention. Additionally, increasing human disturbances caused by coastal development and artificial lighting negatively influence nesting females and disorient hatchlings during their seaward movement. Climate variability further compounds these issues, as rising sand

temperatures pose long-term risks of producing highly skewed sex ratios, potentially affecting the species' population stability in future generations.

**Implications for future conservation.** To improve conservation outcomes for *L. olivacea*, future strategies must adopt a more integrated and technology-driven approach. Incorporating advanced tools such as temperature loggers, satellite tracking, and drone-based monitoring can enhance data accuracy and enable more effective management of nesting sites. Stronger policy enforcement is also essential to control unregulated coastal development and curb illegal trade in turtle products. Equally important is the promotion of sustainable livelihood alternatives, such as community-based ecotourism and the production of marine-themed handicrafts, to maintain local participation and reduce dependency on exploitative activities. Finally, the successful community-driven conservation framework established in Bapatla should be regionally scaled and adapted to other coastal districts of Andhra Pradesh, creating a unified, participatory model for long-term marine turtle protection.

**Recommendations for management and research.** Based on the study findings, several management and research actions are recommended to strengthen *L. olivacea* conservation along the Bapatla coast. First, community logbooks should be maintained and institutionalized, with modest but consistent honoraria and regular training provided to sustain volunteer engagement, as expanded volunteer networks have shown a direct positive impact on nest protection. Second, targeted lighting mitigation measures should be implemented at critical beaches through collaboration with local panchayats and resort operators, including temporal curfews during peak hatching periods. Third, soft-engineering solutions and spatial planning must be prioritized to reduce coastal erosion risks to active nesting sites, while contingency relocation zones should be identified and pre-approved within management plans for areas experiencing acute erosion. Fourth, standardization of effort recording across centres, such as patrol kilometers and patrol hours per night, will allow for more accurate comparisons and trend analyses adjusted for monitoring intensity. Fifth, post-release survival studies using tagging or telemetry are needed to assess long-term recruitment from hatchery-released hatchlings, thereby linking hatchery outcomes to population-level impacts. Finally, simple, ethical threat-impact experiments should be designed to quantify how specific disturbances influence hatchling emergence or orientation, thereby strengthening the empirical basis for classifying threat severity and guiding more evidence-based management interventions.

**Conclusions.** Over a decade of monitoring at Bapatla demonstrates that community-integrated conservation can effectively support *L. olivacea* nesting and hatchling survival in small-scale rookeries. Hatchery emergence averaged 79%, with 72–85% of hatchlings surviving to release, while trained volunteers contributed substantially to nest detection, hatchery operations, and awareness programs. Key threats, including artificial lighting, coastal erosion, poaching, and human disturbance, remain but can be mitigated through targeted management. These findings highlight that even modest nesting sites benefit significantly from participatory stewardship, providing a scalable model for integrating biodiversity conservation with local livelihoods in Andhra Pradesh and similar coastal regions.

**Acknowledgements.** The authors would like to thank to the officers of Andhra Pradesh Forest Department for their essential support in supplying data and facilitating the successful execution of this research project.

**Conflict of interest.** The authors declare that there is no conflict of interest.

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Received: 18 August 2025. Accepted: 22 March 2026. Published online: 14 April 2026.

Authors:

Savanam Chandra Sekhar, KL Business School, Koneru Lakshmaiah Education Foundation, KL University, Vaddeswaram-522302, Guntur, Andhra Pradesh, India, e-mail: savanam.sekhar@gmail.com

Mohammed Irfan, CMR Technical Campus, Kandlakoya 501401, Medchal Road, Hyderabad, India, e-mail: irfanmd2004@gmail.com

Rapaka David Goodwin, Veeravalli Vidya Sundar PG College, Rajahmundry 533101, Andhra Pradesh, India, e-mail: goodwin.dr@gmail.com

Shaik Chand Basha, St. Ann's College of Engineering and Technology, Chirala 523187, Andhra Pradesh, India, e-mail: chandbasha.ong@gmail.com

Ramanatula Emmaniel, St. Ann's College of Engineering and Technology, Chirala 523187, Andhra Pradesh, India, e-mail: dremmaniel@gmail.com

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How to cite this article:

Sekhar S. C., Irfan M., Goodwin R. D., Basha S. C., Emmaniel R., 2026 From exploitation to stewardship: Olive ridley turtle (*Lepidochelys olivacea*) protection in coastal communities. AACL Bioflux 19(2):770-781.